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ABSTRACT

This paper uses the psychology of learning to develop techniques for teaching science at community colleges. In order to maximize student learning, teachers should strive to develop and maintain learner interest through voice inflection and by using a wide variety of teaching methods, including discussions, experiments, demonstrations, lectures, and videotapes. Teachers should also help students to think critically and creatively, and ensure that students actually comprehend, rather than just memorize, content. Teachers can help shape student attitudes to reflect the values of scientists: objectivity, perseverance, and a desire for closure. This paper gives special attention to two methods of instruction: (1) the project method, in which a student selects, plans, and executes a project, with the teacher serving as a helper and evaluator; and (2) the problem-solving method, which is especially appropriate in a laboratory environment. In both cases, it is important for the teacher to develop measurable, precise objectives by which to evaluate the work of the student. An alternative method presented is "subject-centered science curriculum," which emphasizes the development of the students' intellect and critical thinking abilities, by focusing on abstract, rather than concrete, learning activities. All these methods can be appropriate in different situations, and the teacher can decide which is most effective for his or her students. (CAK)

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Teaching Science in the Community College

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TEACHING SCIENCE IN THE COMMUNITY COLLEGE

Science professors in college need to follow definite criteria in the psychology of learning when teaching students. Thus, professors must develop and maintain learner interest. The interests of students is vital if optimal attainment is to accrue. To be interested, the student and the science curriculum become one and not separate entities. A professor then needs to use voice inflection to emphasize that which is salient and important. Proper stress pitch, and juncture in ongoing presentations assist the professor to secure the attention of students. Also, the professor must use a variety of methods of instruction. Variety consists of the use of discussions, experiments, demonstrations, lectures and explanations, videotapes, as well as filmstrips, slides, tapes, and films. Methods of procedure used are geared to having students achieved objectives and goals of instruction. These methods should guide learners to attain as much as possible on an individual basis. In addition to securing the interests of students, the science professor should also guide learners to attach meaning to the ongoing learning opportunities. To attach meaning, the student must understand and comprehend content presented. Memorization of content is not adequate. Rather, the student needs to put acquired subject matter into his/her own words. When learners realize that language is used to present facts, concepts, and generalizations, they have matured in achieving content and abstract ideas in science. Language is a tool for communication and not an end in and of itself. Within the framework of language, the science professor must guide students to think critically and creatively, as well as to plan and follow through in attaining worthwhile ends (Ediger, 1994, 76-77).

In addition to interest and meaning, the science professor must assist learners to develop quality attitudes. These needed attitudes consist of being able to stress objectivity in one's investigations and approaches in dealing with scientific phenomena. A desire to learn more and conceive of learning as being lifelong and having no end truly

reflects the attitudes(s) of scientists. Persevering with the task at hand and not letting up is salient. With persevering, the student in science pursues until goals have been attained. Perceiving gaps in knowledge provides impetus in wanting to narrow or eliminate the gap. Thus an attitude of wanting to know and desiring closure is then in evidence. Quality attitudes guide the student in wanting to achieve optimally in science (Ediger, 1997, 27-37).

Philosophy of Teaching Science

The community college professor of science needs to view and understand diverse philosophic schools of thought in order to assist each student to attain optimally. A project method may be used in whole or in part. With the project method, the professor encourages each learner in context to select a project to complete. The professor is a stimulator and helper here not a lecturer nor explainer. The student selects the project to complete. The professor provides input as needed in the project method of teaching science. Once the student has chosen a project, he/she then plans how to achieve the purpose of project completion. The planning must be thorough and comprehensive. After its planning, the learner may then actually implement the plans. Here is where the actual work by the student is viewed and sequential steps noticed to achieve closure of the project. Following the completion of the project, evaluation of its quality needs to be in evidence. Criteria of excellence must be used to appraise quality. The professor of science must be available, if at all possible, to give needed help to learners at each step along the way in the project method of instruction. Project methods are quite open ended in terms of a philosophy of teaching. Student are heavily involved in decision making. A project may stress the making of teaching aids in a teaching of science course, developing models of elements making one or more compounds, writing a term paper that investigates a problem area, or giving a report in class that emphasizes answering a question identified by learners in the class

setting (Ediger, 1997, 18-22)

Problem solving methods have a little more structure as compared to project means of teaching. In ongoing lessons and units of instruction, a problem is identified. The problem requires data gathering in depth. A variety of reference sources are use to secure the needed data. A hypothesis results. The hypothesis must be clearly stated and is subject to testing. Revision of the tentative hypothesis may be necessary as a result of the test (See Ediger, 1995, 7-10).

Problem solving in experiments and in the laboratory setting might well be the heart of the methods of science. Other materials should also be used to gather data and to check hypothesis such as reading sources and audiovisual methods. Problem solving is a valuable skill in science as well as in life itself. In life, individuals and groups continually select and arrive at solutions, usually tentative in nature, to problems. Hypothesis and answers are continually subjected to new experiences with revisions in the offing. Problem solving works well too in all courses that students take be it in the social sciences, language and literature, mathematics, as well as others. Students continually face the problem of how to study for a test in any course or class being taken. Financing a student's costs of pursuing higher education is becoming an increasingly great problem to solve (Ediger, 1995, 1-10).

Community college professors may use measurably stated objectives in teaching- learning situations. The professor writes these objectives as precisely as possible. There is no guesswork involved in determining what students are to learn when analyzing these ends. A student either does or does not attain each objective. The professor may even announce to the class prior to instruction what they are to learn in today's lesson. Learners then have security in knowing what they will be responsible for learning. Students have increased security in realizing items that will be on a test, be it criterion referenced or teacher written test items such as true false, multiple choice, matching, completion, and/or essay. With measurably stated objectives, the professor or his/her colleagues will come up with the same results when scoring test

results. Interscorer reliability is important in that consistency of results should be in the offing when these evaluators score tests of each student. Objectivity is a key concept to stress in scoring tests as well as in determining what will be taught to students when viewing each measurably stated objective in teaching and learning situations. Validity becomes a key concept when harmonizing evaluation procedures with the stated objectives. Measuring then is always done in terms of objectives stressed in the science curriculum. What is taught is emphasized within each objective of instruction. Thus the learning activities match up with the objectives as well as the evaluation procedures with the stated objectives. The professor may count the number of objectives attained by each student. Scores on tests may be phrased for each student in terms of percentiles, standard deviations above and below the mean, as well as in quartile deviations. Numerical results are then wanted from students (Ediger, 1997, 41-43).

As another philosophy, a subject centered science curriculum may be emphasized. The abstract is then preferred to the concrete and semiconcrete in terms of learning activities provided for students. Mind is real and needs to be developed in a subject centered approach in the teaching of science. Mental development of students becomes a primary objective of instruction. Quality attitudes as a goal of instruction may be stressed if they assist learners to attain more optimally in the knowledge domain (See Ediger, 1994, 1-4).

The community college professor here needs to emphasize cultivation of the intellect in teaching and learning situations. Higher levels of cognition including critical thinking and analyzing of content presented in ongoing lessons and plans of instruction must be stressed. Students then need to achieve vital facts, concepts, and generalizations in the science curriculum. The professor of science instruction must select with great care that which assists learners to develop well intellectually and guides each to acquire worthwhile content (Ediger, 1997, 1-15).

Heavy learner input in to the science curriculum is still another

philosophy of instruction. Here, students may choose what to learn and which to omit in terms of learning activities and experiences. Thus, a learning stations approach may be stressed. The professor then needs to develop stations with four to five tasks at each station. At each station a variety of types of learning opportunities need to be in the offing. Students may also plan with the professor alternative tasks to complete. Time on task is always salient for students when selecting individual or committee endeavors at the divers stations of instruction. Students should alsó be involved in appraising their own individual or group performance. Quality criteria must be used to appraise progress. The professor serves as a guide and motivator, not a lecturer. Learners need to assume personal responsible for their progress and achievement. Stations of instruction may be developed by the professor or better yet through professor -student planning (Ediger, 1998, 34- 44).

In Closing

Community college professors have within their grasp selected guidelines to use in teaching students. From the psychology of learning, professors need to make lessons in science interesting and use a variety of learning activities. Students must perceive meaning in ongoing activities. Purpose in learning is of utmost importance in that learners then accept intrinsic reasons for achieving. Quality attitudes assists students to attain optimally.

Philosophy of instruction provides further guidance to the professor in teaching- learning situations. Each should be used as it assists learners to achieve more optimally. These philosophies include the project method, problem solving, measurably stated objectives, subject centered procedures, and student choice. The professor is the decision-maker as to which philosophy to stress to guide each student to learn as much as possible (Ediger, 1996, 29-31).

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